Development of Renewable Energy in Hong Kong

Ir S K HO
Chief Engineer
Energy Efficiency Office
Electrical and Mechanical Services Department

12 Jan 2008

機電工程署 EMSD

Sustainable Development Strategy

- Published in 2005
- Set a target of having between 1% and 2% of HK's total electricity supply met by power generated from RE by 2012

機電工程署 EMSD

1% scenario by 2012 based on RE Study

Technology	Electricity generated	Indicative installations
Land-based wind turbines	6 GWh	3.2 MW (4 x 800 kW)
Offshore wind turbines	7 GWh	4 MW (2 x 2 MW)
Energy-from-waste (landfill gas power generation)	184 GWh	30 MW
Energy-from-waste (thermal treatment)	145 GWh	17 MW (1,000 tpd)
Photovoltaic (PV) power stations	6 GWh	50,000 m^2 PV panel area (20 x 350 kW = 7 MW)
PV on buildings	7 GWh	58,000 m^2 PV panel area (23 x 350 kW = 8 MW)
Total	355 GWh	

2% scenario by 2012 based on RE Study

Technology	Electricity generated	Indicative installations
Land-based wind turbines	6 GWh	3.2 MW (4 x 800 kW)
Offshore wind turbines	7 GWh	4 MW (2 x 2 MW)
Energy-from-waste (landfill gas power generation)	184 GWh	30 MW
Energy-from-waste (thermal treatment)	460 GWh	52 MW (3,000 tpd)
Photovoltaic (PV) power stations	6 GWh	50,000 m^2 PV panel area (20 x 350 kW = 7 MW)
PV on buildings	7 GWh	58,000 m^2 PV panel area (23 x 350 kW = 8 MW)
Total	670 GWh	

Developments in Selected RE Technologies and Applications in Hong Kong

機電工程署 EMSD

RE Technologies Having Potentials for Application in Hong Kong

- Solar
- Wind
- Energy-from-waste

Solar Water Heating Technology

- Flat plate type, evacuated tube type
- Heat-pipe evacuated tube type now becoming more popular

機電工程署 EMSD

Solar Water Heating Technology

Largest solar water heating installation in Hong Kong - Sheung Shui Slaughter House, with 882 square metres of solar collectors

機電工程署 EMSD

PV Technology

- Main types in the market
  - Poly-crystalline silicon
  - Mono-crystalline silicon
  - Amorphous silicon

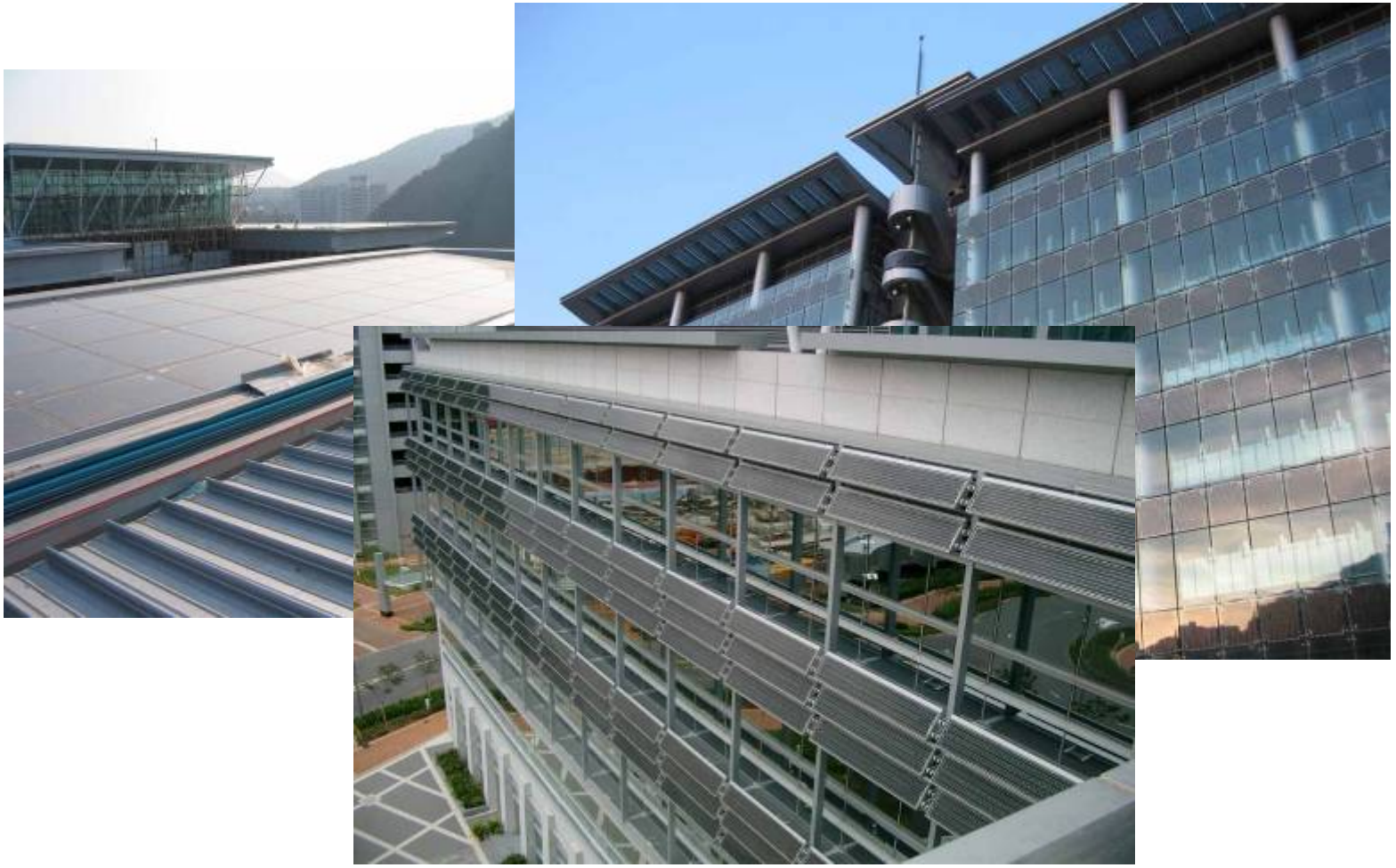
Examples of Applications of PV

- Solar-powered lamp pole
- PV power supply systems for remote villages, equipment in remote locations
- Wind/solar hybrid systems for remote locations
- Building-integrated photovoltaic (BIPV) systems
- PV power station

Local PV Installations

- Total installed peak capacity for government projects about 800 kW
- Many small-scale standalone systems
- Larger systems are mostly installed on buildings, using PV panels or PV glass units

Science Park – 198 kW



機電工程署 EMSD

Castle Peak Hospital – 30 kW

機電工程署 EMSD

Penny's Bay Fire Station and Police Post – 85 kW

Kowloon Hospital – 10 kW

機電工程署 EMSD

Airport Police Station – 16 kW

機電工程署 EMSD

Kei Wai (Tsuen Wan) Primary School, Ma Wan

機電工程署 EMSD

Wanchai Tower PV System

- Constructed in 2002 as a grid-connected PV pilot project of EMSD
- Performance monitored from April 2003 to March 2004
- Report available for download from EMSD website

機電工程署 EMSD

Wanchai Tower PV System

Total PV Panel Area	500 m^2
Total Installed Capacity	55 kW
Orientation and tilt angle	South & 10^o
No. of Sub-systems	3
Grid connection	Yes

機電工程署 EMSD

EMSD Headquarters PV System

- Largest grid-connected PV installation in HK
- Over 2,300 PV panels installed – 350 kW
- Rack type and skylight type

機電工程署 EMSD

EMSD Headquarters PV System

- Target annual electricity yield is 300 to 400 MWh
- Performance monitoring in progress since September 2005

機電工程署 EMSD

Small Wind Turbines

機電工程署 EMSD

Large Wind Turbine

- 800 kW wind turbine at Lamma Island, by Hongkong Electric
- Another large wind turbine will be constructed by CLP Power

Developments in Wind Turbine Technology

- More and more offshore wind farms
- Steady increase in size, with 5 MW machines produced by several manufacturers
- Variable speed technology, gearless designs, improvements in blade design to provide higher energy yield and reduce noise

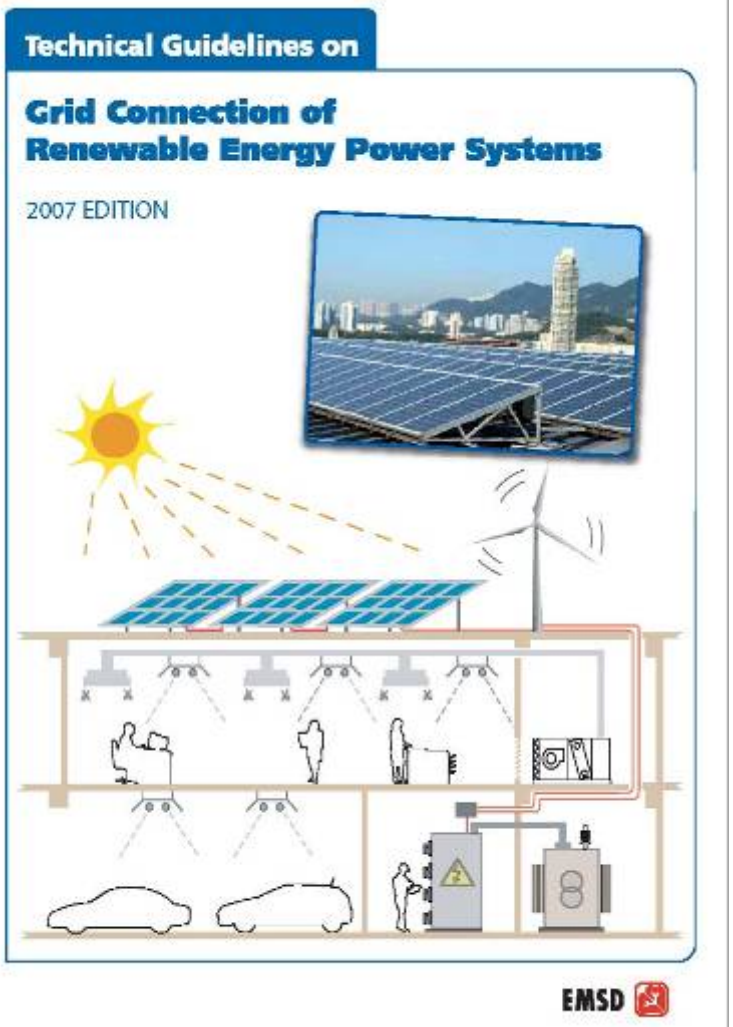
Some Measures to Support RE Development in Hong Kong

- Adoption of RE technologies in government projects and installations
- Technical Guidelines on Grid Connection of RE Power Systems
- Portal web-site to provide information on RE technologies

Grid Connection Guidelines

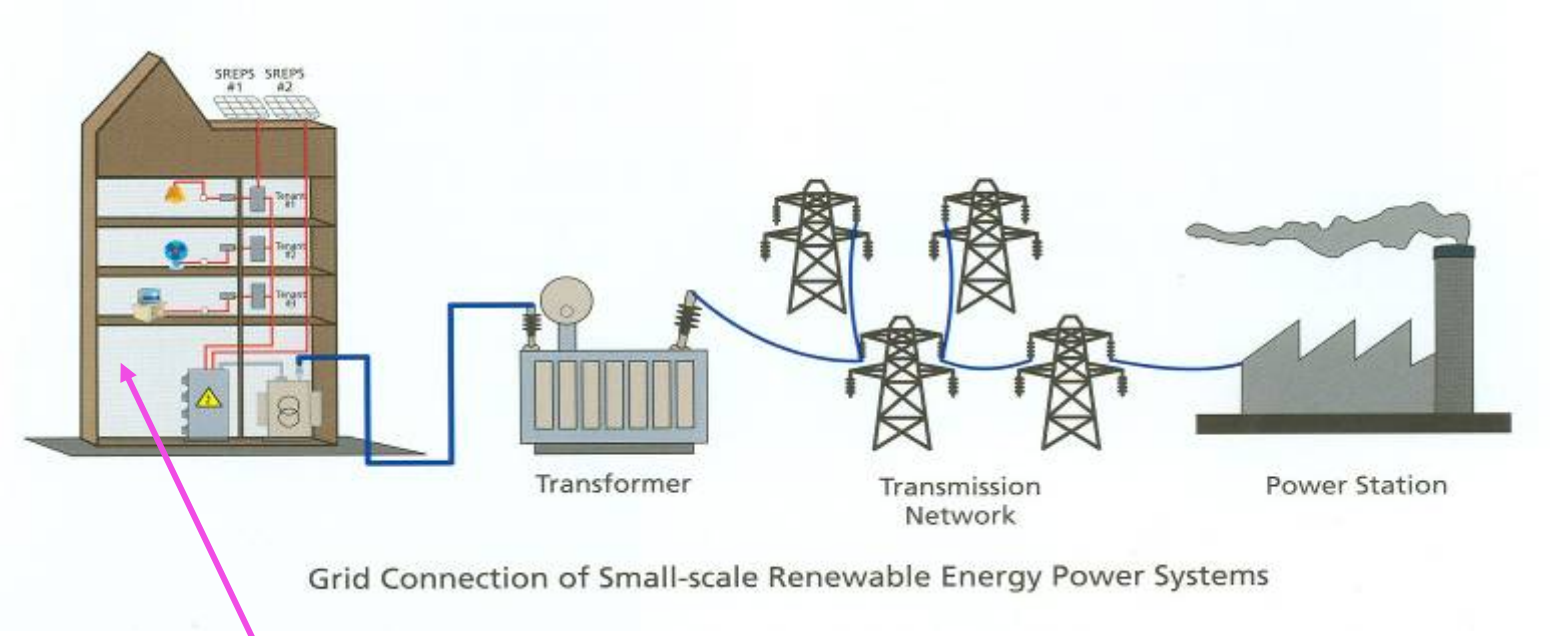
Technical Guidelines on Grid Connection of Renewable Energy Power Systems

2007 Edition



機電工程署 EMSD

Grid Connection Guidelines



Grid Connection of Small-scale Renewable Energy Power Systems

"RE User"

機電工程署 EMSD

Grid Connection Guidelines

- Applicable to grid-connected RE systems with aggregated power rating up to 1000 kW per project

- Cover 4 major technical aspects
  - Safety
  - Equipment Protection
  - Reliability
  - Power Quality

HK Sustainable Technology Net
(http://sustech.emsd.gov.hk)

- An Internet portal to serve as an information hub for Sustainable Technologies in HK

機電工程署 EMSD

Proposals for Offshore Wind Farms in Hong Kong

Ref: PD/900/00/00

PROJECT PROFILE

DEVELOPMENT OF A 100MW
OFFSHORE WIND FARM IN HONG KONG

July 2006

Revision 0

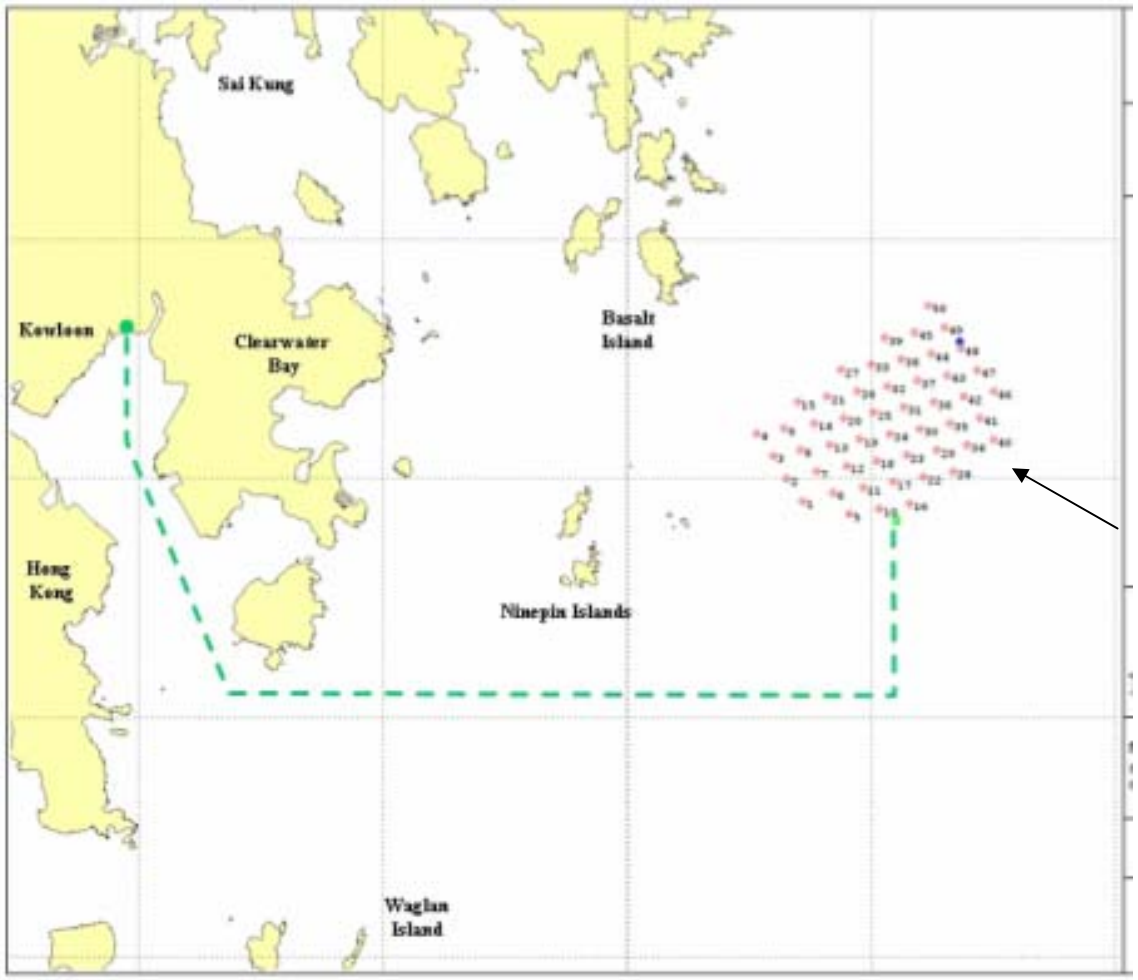
香港電燈有限公司
The Hongkong Electric Co., Ltd.

Hong Kong Offshore Wind Farm in Southeastern Waters

Project Profile

April 2006

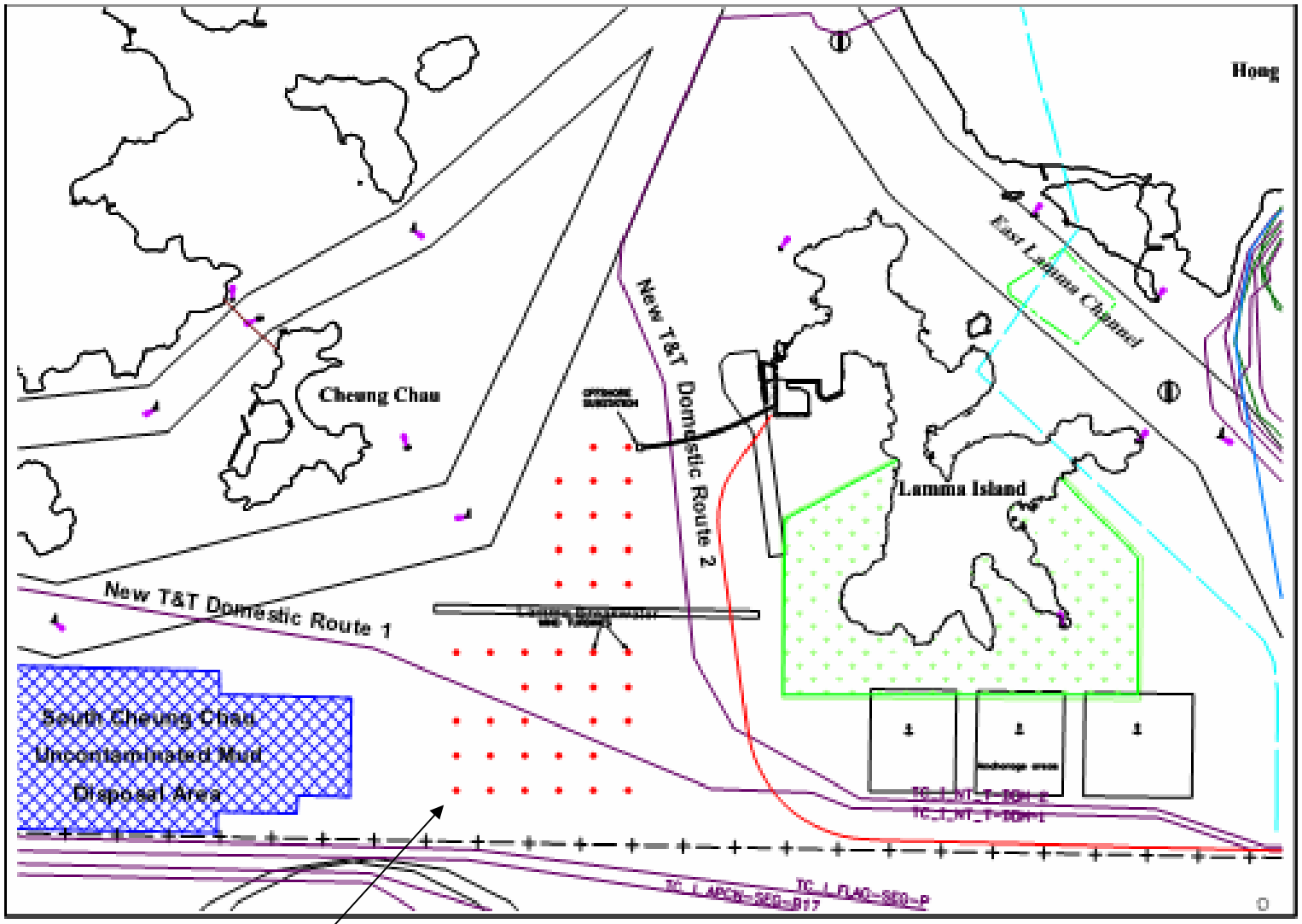
機電工程署 EMSD



Offshore wind farm proposed by one power company / wind power developer

機電工程署 EMSD

Source: Project Profile for Proposed Offshore Wind Farms



Another location proposed for the offshore wind farm

機電工程署 EMSD

Source: Project Profile for Proposed Offshore Wind Farms

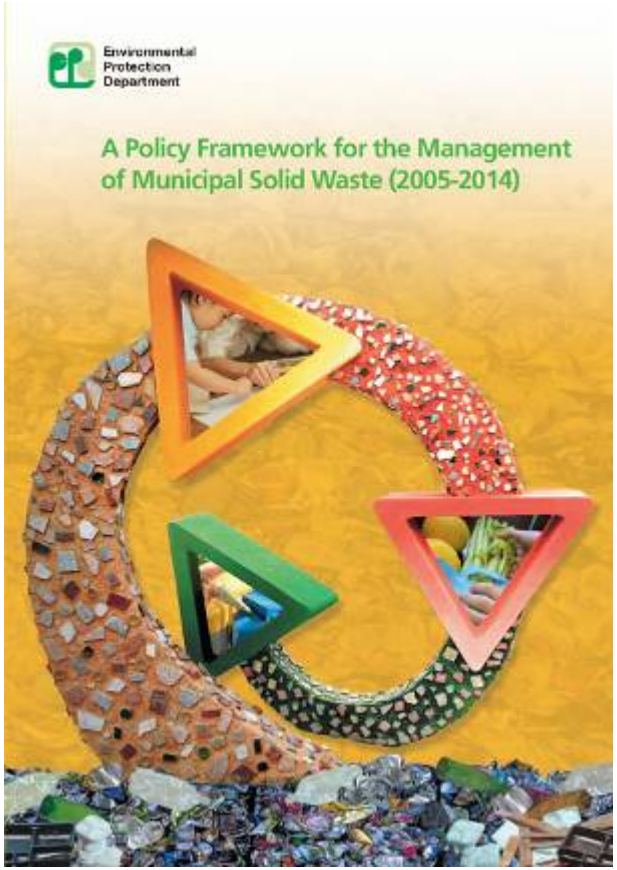
- Preparation is under way by a power company to conduct offshore wind measurement at their proposed site

Offshore wind farm scenario – current estimate

Technology	Electricity generated	Indicative installations
Land-based wind turbines	6 GWh	3.2 MW (4 x 800kW)
Offshore wind turbines	516 GWh	295 MW (65 x 3 MW & 40 x 2.5MW)
Energy-from-waste (landfill gas power generation)	184 GWh	30 MW
Energy-from-waste (thermal treatment)	145 GWh	17 MW (1,000 tpd)
Photovoltaic (PV) power stations	6 GWh	50,000 m^2 PV panel area (20 x 350 kW)
PV on buildings	7 GWh	58,000 m^2 PV panel area (23 x 350 kW)
Total	864 GWh (2.5%)	

Energy-from-Waste Thermal Treatment

- Policy Framework for Management of Municipal Solid Waste (2005-2014)
  - Proposed the state-of-the-art Integrated Waste Management Facilities with Incineration for final waste treatment



Energy-from-waste Installations

- Landfill gas power generation
  - Total generation capacity about 7.4 MW

機電工程署 EMSD

Energy-from-waste Installations

- Landfill gas for heating
  - Heating fuel for the production of towngas

機電工程署 EMSD

Energy-from-waste Installations

- Biogas power generation and heating at sewage treatment works

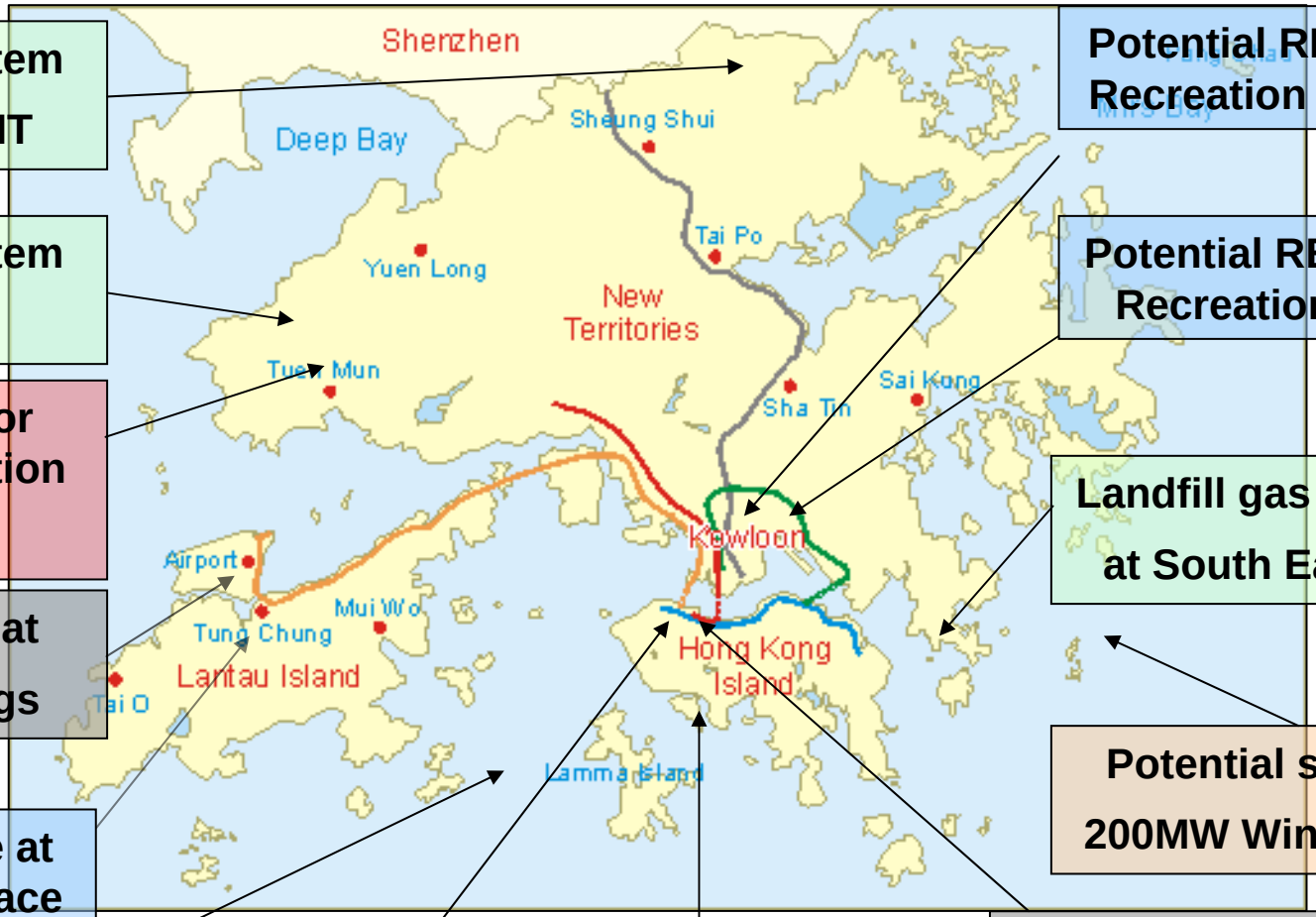
Shek Wu Hui STW installed a biogas generator for electricity and heat generation

機電工程署 EMSD

Conclusion

- Despite its small geographical area, Hong Kong has made continuing progress in the area of RE
  - Government's efforts in promoting the use of RE, undertaking demonstration projects, public education and conducting studies on RE
  - and also through the efforts of the power utilities, private sector and the academia
- With various sectors of the community working together, it is expected that more RE systems will be installed in various locations in Hong Kong in the near future.

Potential business opportunity is about 1 billion US dollars!



Landfill gas system at North East NT

Landfill gas system at West NT

Potential site for Central Incineration Plant

RE Installation at Airport Buildings

Potential RE site at District Open Space

Potential site for 100MW Wind Farm

Potential RE site at Park

Potential RE site at Recreation Ground

Potential RE site at Recreation Ground

Potential RE site at Recreation Park

Landfill gas system at South East NT

Potential site for 200MW Wind Farm

RE Installation at major Government Offices

機電工程署 EMSD

Thank you